APPENDICES TO "FROM AGRICULTURE TO INDUSTRY"

Appendix A: DATA SOURCES FOR TABLE 1

Illiteracy: The data came from the rough estimates of Carlo Cipolla (1969). The datum for the United States is based on a rough estimate, staring with census data for 1850 on illiteracy among whites and free blacks. For black slaves I assumed an illiteracy rate of 90 percent, roughly double that of the free blacks. Assuming that illiteracy was only slightly higher in 1800, I adjusted these percentages upward by four percentage points and then used these rates to estimate total adult illiteracy in 1800, relying on census data for various population groups from U. S. Bureau of the Census 1975, Series A119-34) and making several small additional estimates to calculate the adult black population.

Urbanization rates: The urbanization rate is the percentage of the population living in towns larger than 5000. Most data on urbanization rates were drawn from Bairoch et al, (1988). For some countries, however, I had to rely on the detailed data on cities, rather than their summary statistics, and, in such cases, used population data taken directly or estimated from Mitchell (1998). For the United States I used data from U.S. Census Bureau (1975, Series A43-56).

Threshold of industrialization: This is set at the level of per capita manufacturing production in England in 1778, as estimated by Paul Bairoch (1982). I assume exponential growth between his benchmark years to calculate when other countries achieved this level.

Appendix B: ON AGRICULTURAL REVOLUTIONS

The common argument about the necessity of an agricultural revolution - a dramatic upsurge in agricultural production and productivity - preceding the industrial revolution implicitly assumes that high agricultural productivity is not enough and that this change in the agricultural sector must have a certain time pattern as well, which implies a particular malleability of institutions. It is useful to look more carefully at the evidence supporting this claim.

In the mid 20th century economic historians generally believed that an agricultural revolution necessarily preceded an industrial revolution.[1] In more recent years, however, they have become more cautious about such matters, noting that rising agricultural productivity could have been an evolutionary process occurring over centuries, not decades. Variant views include the proposition that, in England, two different types of major agricultural transformations took place (Allen, 1999); or that an agricultural revolution occurred, but alongside, not before, industrialization.

To provide some clarity on these issues, it is useful to turn to the actual experience of early industrializing nations. For England a considerable amount of qualitative is readily available. We know about the adventures of such wonderful characters as "Turnip" Townsend, who preached the doctrine of the new fodder crop. We have also learned about such agricultural innovations as the introduction of clover and other fodder crops, the use of new crop rotation schemes such as the Norfolk system, Jethro Tull's new method of planting and cultivating wheat and root crops, the

[1] For instance, according to Robert Brenner (1985-b, p.323): "It was the growth of agricultural productivity, rooted in the transformation of agrarian class or property relations, which allowed the English economy to embark upon a path of development already closed to its Continental neighbours. The path was distinguished by *continuing industrialization* and overall economic growth *through* the period when "general crisis" gripped the other European economies, and into the epoch of the industrial revolution."

improved Rotherham triangular plow, the improved hand tools for cutting grain, the new irrigation systems (floated water-meadows), or the new methods for breeding better cattle that occurred in the 18th century. But many such discussions about the agricultural revolution assume, with rather slim evidence, that these innovations were rapidly diffused..

Certain useful cross-national evidence supports the notion of agricultural revolution as well. For instance, Morris and Adelman (1988) examine the linkage between a growth in agriculture and in manufacturing using a factor analysis of economic and institutional characteristics of 23 nations in the latter half of the 19th century. Using mid 19th century data they find (p. 134) *increases* in agricultural productivity preceded the earliest spread of manufacturing in countries industrializing the earliest, and the reverse in countries which were late in industrializing.

Despite such evidence, certain nagging doubts arise. In particular, according to the estimates of N.F.R. Crafts, agriculture production in England in the 18th century - when the agricultural revolution was allegedly occurring - grew at an average rate of only 0.5% per year; on a per capita basis, there was no significant change at all, and agricultural production per rural dweller grew at an average annual rate of only 0.1 percent.[2] Although agricultural productivity and production undoubtedly increased significantly in some areas, such results hardly show the widespread use of the new innovations or an agricultural revolution and require us to reexamine the issue from a more

[2] For these calculations the population data come from Wrigley and Schofield (1981), the data on the rural population from Wrigley (1987, p. 162); and the agricultural production data, from Crafts (1985, p. 42). I have fitted an exponential curve to the data to avoid endpoint problems and have interpolated for the missing years. The earlier estimates of agricultural production by Phyllis Deane and W. A. Cole (1969) show an even lower growth.

comparative perspective.[3]

Table B-1 about here.

Table B-1 presents comparable data on the date of the threshold of industrialization for countries which reached this point before 1914. These data present a very mixed picture, both before and after the threshold of industrialization was reached.

More specifically, in the quarter century before reaching the industrialization threshold, Eleven out of the 17 nations had a declining or barely increasing rate (i.e., annually, +0.2 percent or less) per capita agricultural production. Rougher estimates show that 7 out of 13 nations had a declining or barely increasing (i.e., annually, +0.2 percent or less) agricultural growth per agricultural worker. It is noteworthy that this growth rate was inversely and significantly related to the GDP per capita in 1820, which suggests that those nations with low agricultural productivity per worker needed time to "catch up" before industrialization could take root.[4]

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[3] It must be added that agricultural productivity can increase in a variety of institutional settings, depending on the type of change which occurred. For instance, higher agricultural productivity could be achieved by land reclamation, clearing and drainage (land extensive investments) or new crops, or use of fertilizers, new tools and implements, more effective use of animal power, superior buildings, new rotations such as convertible husbandry, or new techniques such as water meadows (land intensive investment). Although most do not seem impossible to carry out in different types of agricultural economic system, some of these changes such as use of better crop rotation schemes might have proved difficult to introduce in highly communal economic systems where economic activities were strongly coordinated by political or religious authority. Furthermore, many of the benefits and costs of adapting the new innovations depended on the crops cultivated, the soil types, and climatic conditions.

[4] The relationship is:

AAGAPW = 0.0245* - 0.000111 Ycap R = .5858
(0.0050) (0.000030) n = 13,

where AAGAPW is average annual growth of agriculture product per worker in the quarter century before the industrialization threshold was reached

Ycap = per capita GDP in 1820.

Table B-1: Indicators of Agricultural Sufficiency, Growth, and Labor Productivity before 1914

Country	Estimated date of threshold of of industrial-ization	25 years before industrial-zation threshold		25 years after industrial-zation threshhold	
		Annual average per capita agricultural growth	Annual average agricultural labor produc-tivity growth	Annual average per capita agricultural growth	Annual average agricultural labor produc-tivity growth
England	1778	-0.4%	-0.4[a] %	-0.3%	+0.1[a] %
Switzerland	1817	-	-	-	-
Belgium	1823	-0.4	-0.2	-0.0	-0.0
United States	1825	+0.1	+0.2	-0.0	+0.3
France	1835	+0.7	-	+0.7	+1.8
Germany	1852	-	-	+0.9	+1.2
Sweden	1852	+0.4[b]	-	+0.9[b]	- 1.7[b]
Norway	1873	-0.1[c]	-	-1.1[c]	-3.1[c]
Austria[d]	1876	-0.0	+0.2	+0.5	+1.1
Finland	1876	-1.9[e]	+1.2[e]	-0.8	+0.6
Netherlands	1881	-0.4	-0.1[g]	-0.5	+0.1[g]
Spain	1881	+1.3	+1.0	-0.1	+0.2
Denmark	1885	-0.2	+0.2	+0.7	+1.7
Canada	1886	+1.3	+1.3	+1.1	+1.9
Italy	1887	-0.3	-0.5	+0.8	+1.3
Russia	1899	+1.2	+1.3	+1.7	+1.6
Japan	1902	+0.2	+1.1	+1.3	+2.4
Australia	1904	-1.3	-	+1.1[e]	-
Portugal	1907	+0.8	+1.8	-	-

Notes: a = rural population, rather than rural labor used; b = index of grain production used and may overstate rates; c= index of grain production use; d = Austro-Hungarian Empire; all other data refer to the Austrian half of the empire. All growth rates calculated by fitting an exponential curve to the series to minimize endpoint problems; e = 9 years; f = 14 years; g = value added per man hour.

Data sources are presented in Appendix C.

In the quarter century after reaching the threshold of industrialization only 4 nations out of 17 had a declining or barely increasing (i.e., annually, +0.2 percent or less) per capita agricultural production. And rougher estimates show that 6 out of 16 nations had a declining or barely increasing rate (i.e., annually, +0.2 percent or less) of agricultural growth per agricultural worker

In brief, if we define an agricultural revolution as manifested by a rapid annual increase of per capita or per worker agricultural production (more than +0.2 percent), then the evidence does not reveal such a major change in the quarter century before or after the threshold of industrialization was attained. The inverse relationship between per capita GDP (a proxy for agricultural productivity) and the date of the industrialization threshold, however, provides some support that an agricultural revolution usually (but not always) preceded an industrial revolution, although this revolution must be interpreted as occurring over centuries. The regressions reported above also suggest that if a "visible" agricultural revolution occurred in the years immediately preceding the industrialization threshold, it was more likely in those nations with low initial agricultural productivity.

Appendix C: DATA SOURCES FOR TABLE 2 IN THE TEXT AND B-1 IN THE APPENDIX

I calculated all growth rates by fitting an exponential curve to the data. In many cases, however, I had to interpolate between the selected years presented by the various authors and this, of course, introduces small errors into the final results of the calculations.

Australia: The population data come from Maddison (1995, p. 104; 2001, p. 189) and include aboriginal population as well as settlers. Remaining data come from Butlin (1962). Current export series deflated by a price indices for pastoral, agricultural, dairying, and mining production, weighted according to my roughly estimated proportion of exports in 1900.

Austria: All data come from Kausel (1979). The GDP data cover the Austrian half of the Empire, that is, Austria proper, Bohemia, Moravia, Silesia, Galicia, Bukovina, and Dalmatia. This study included series on the GDP and it components, population, and agricultural labor force. The export data refer to the Austro-Hungarian empire as a whole..Current export data come from Mitchell (1998) and are deflated by wholesale prices from the same source and, when not available for the earliest decade, by estimated wholesale prices based on a regression equation linking wholesale and retail prices.

Belgium: The population data come from Goossens (1993, p. 366), as does the labor days worked in agriculture (p. 254) from 1812 to 1846. The GDP/capita and agricultural production data come from Buyst (2002) and represent interpolations from three years: 1770, 1812, and 1846. The agricultural series is quite similar to one derived from Goossens (1993) and Blomme and Van der Wee (1994). The export data come from Maddison (1991).

Canada: All data come from Firestone (1968). GNP, rather than GDP, data are presented in Table 5-2.

Denmark: Data on GDP come from Hansen (1973). These study included GDP and its components, population, and agricultural labor force. Denmark. Current export data come from Mitchell (1998) and are deflated by wholesale prices from the same source (when not available for the earliest decade, by estimated wholesale prices based on a regression equation linking wholesale and retail prices).

England: GDP and agricultural production series come from Crafts (1983). The population come from Wrigley and Schofield (1981). Since data on rural workers are not available, I used the rural population estimates of Wrigley (1987). The export data come from Deane and Cole (1969), p. 44.

Finland: Data on GDP and its components, exports, population, and agricultural labor force come from Hjerppe (1989).

France: The GDP data come from Toutain (1987). Data on population, labor force in agriculture, exports in current prices, and a wholesale price index (used to deflate the export series) come from Mitchell (1998).

Germany: All data series come from Hoffman (1965).

Italy: All data series come from Ercolani (1969).

Japan: All data series come from Ohkawa and Shinohara (1979). The GDP series is, however, adjusted to take into account the corrections by Maddison (2001), pp. 205-6.

Netherlands: All data come from Smits, Horlings, and van Zanden (2000), Tables D-1b, D-2b, D-4, H-1, and I-5. All series were in constant prices except exports, which were deflated by the GDP deflator. Labor hours were used to agricultural/worker series.

Norway: Agricultural production was calculated from an index of grain production. The

underlying data, as well as the data on agricultural labor force, come from Mitchell (1998). All other series come from Norway, Statistisk Sentralbyra (1965).

Portugal: Data for workers in the agricultural sector come from Mitchell (1998). All other data are from Lains (1995). Exports are his "corrected" estimates of official data.

Russia: The Russian data do not seem very reliable and are only for a subset of the European provinces. Population and current export data come from Mitchell (1998). GDP data in current and constant prices are from Gregory (1982) and the implicit GDP price index is used to deflate the export data. Recently published estimates of 19th century industrial production by Lev Borisovich Kaferganz (analyzed by Gregory 1997) suggest that the GDP growth rates are higher than previously estimated because manufacturing growth was understated. Agricultural production (from Gregory, p. 240) represents net production of major grains. His series, however, only extends back to 1885, while Goldsmith's series (1961) is for gross production of major grains and extends back to 1874 For this period before the industrialization threshold I started with the Goldsmith series and, after calculating the growth rates, adjusted it upward by the difference between the Gregory and Goldsmith series for the period. Agricultural labor force data are extremely rough and were calculated from growth rate data presented by Gregory (1981, p. 133); they appear to be a residual after labor force estimates for other sectors were subtracted from an estimate of total labor force.

Spain: All series come from Prados de la Escosura (2003).

Sweden : An index of grain production and potatoes was calculated from data presented by Mitchell (1998). From a comparison of agricultural production for 16 years from the national accounts, this series may overstate total agricultural growth. Data on the agricultural labor force, exports in current prices, and wholesale prices (used to deflate the export data) come from Mitchell.

All other data come from Krantz and Nilsson (1975) and Sweden, Statistiska centralbyrran (1969).

USA: Data on GDP, agricultural production, and agricultural labor force come from Weiss (1994). Population data, exports in current prices, and a the Warren-Pearson wholesale price index come from U.S. Bureau of the Census (1975), Series A7, U2, and E52.

Appendix D: ARE MY CONCLUSIONS BIASED BY THEIR FOCUS ON EUROPE?

The nations used in the comparisons are primarily those which reached the industrialization threshold sometime between the late 18th and the early 20th century, a span of 130 years. These were mostly European nations. While it would have been useful to include in the sample various nations which did not reach the industrialization threshold before 1914, data for the comparisons are not available for many of them. Does such a procedure bias the results which I obtain?

To arrive at an answer, a key issue is whether the nations of Europe and the countries considered "third world nations" (TWN) after World War II started from the same level of economic development in the 18th century? Existing estimates of the ratio of the average per capita GDP of the TWN to that of the Western European nations in the middle of the 18th century vary considerably. Paul Bairoch (1993, pp. 106-8) provides a useful survey, showing that in the 1960s and 1970s, most estimates of this ratios varied between 0.4 to 0.5. His own estimate for 1750 (Ibid., p. 104) is much higher - about unity - and he uses certain qualitative evidence to support this view, for instance, the great awe early European travelers held of the rich cities in Asia and the Americas. More recently, Pomeranz (2000) supports Bairoch's position, but relies only on isolated indicators from China and various European nations.

Recently Angus Madison (2001, p. 264) has presented estimates of this ratio which are much higher: it was 0.69 in 1500, 0.54 in 1700 and 0.47 in 1820. His position is also supported by qualitative information. For instance, Alan Macfarland (1978, p. 4) emphasize the much lower living standards of farmers of today living in the developing world today (such as India or China) and English villagers in the 17th century.

Unfortunately, Bairoch does not explain in much detail how he made his estimates for the

third world and some of his estimates seem counterintuitive. By way of contrast, Maddison (1995, 2001) discusses in some detail his methods and the evidence he used for his estimates. His explanations seem reasonable. For this reason, I place more credence on his calculations and have used them in my analysis. The question of whose estimates are more credible has some important implications in understanding the course of industrialization in the third world.

Those who assume that the levels of per capita GDP in Europe and the rest of the world were small in the 18th century have offered various explanations of the relative economic backwardness of third world nations in the 20th century. These include demographic behavior and climate fluctuations, economic institutions, colonial exploitation, or resource pressure and colonial trade. Some of these explanations, however, seem incorrect. For instance, the demographic/climatic fluctuations hypothesis advanced by Jones (1981) can be tested if we can generalize about the weather in China during the period from 1500 to 1900 from weather data in the 20th century. (Pryor, 1985) shows that it was little different from that of certain European nations and, as a result, has no explanatory value in explaining Chinese economic backwardness. The impact of colonialism seems a more promising explanation, for instance an hypothesis focusing on resource pressure and the role of colonial trade advanced by Pomeranz (2000).

Those who assume that the levels of per capita income in the two parts of the world were very different have offered much different explanations for the relaitve backwardness of the third world nations in the 20th century. For instance, Maddison (1983) and others have focused attention on a variety of institutional and organization factors including Europe's scientific precocity, centuries of slow accumulation of capita which resulted in greater agricultural productivity, and a superior economic infrastructure including transportation facilities and financial institutions.

The most plausible analyses of industrialization, using either the Bairoch or the Maddison results about the starting points of Europe and the rest of the world in the middle of the 18th century, place the most emphasis on sectors of the economy other than agriculture. For this reason, I do not believe that my primary focus on Europe seriously biases my results.

Appendix E: THE IMPACT OF LAND OWNERSHIP AND TENURE ARRANGEMENTS ON INDUSTRIALIZATION

Several arguments can be made about the influence that land tenure arrangements and the concentration of land ownership had on industrialization in the 18th and 19th centuries:

*Decision-making autonomy. Farmers would be unlikely to develop habits of independent decision-making and entrepreneurial attitudes which would be useful for urban or manufacturing environments in tenure arrangements where community leaders or customs determined key production decisions - when, where, and what to plant or when to weed and harvest. This means, for instance, that communally-directed open-field agriculture in the 18th and 19th centuries was not conducive to industrialization.[5]

* Free labor. According to common belief, useful habits and attitudes for industrialization were unlikely to develop among serf or slave laborers. In this regard Alexander Gerschenkron has argued (1966, p. 48): "The institution of labor services [before emancipation in Russia] bred mendacity and deception. The serf-entrepreneurs had many excellent reasons to deceive their owners. The legal uncertainty with regard to peasants' property rights was hardly designed to educate the mass of the population in the spirit of respect for contractual obligations." Many also argue that industrialization was also not encouraged with barriers to mobility from the countryside. For instance, in Russia after the emancipation, peasants were still not "free laborers" because they could not permanently leave the village (mir) without giving up land rights, paying a high fee, and receiving permission from village authorities (Ibid, 120). If they temporarily worked outside the

[5] Robert Allen (1999) presents evidence that certain types of open-field agriculture, which was not communally directed and allowed individual decision-making, in certain periods exhibited the same rise in productivity as other farmers.

community, they could also be called back at any moment. It might be added that given certain types of class relations between serfs and landowners, the former were subject to high extractions in terms of rents and labor services by the latter, which was also not conducive to the industrialization process. Nevertheless, as I previously suggested, in certain cases these arguments are overdrawn since such values and attitudes could be sufficiently modified (as in the case of Russia) that industrialization could take place...

* Secure tenancy. Useful habits and attitudes for industrial and/or urban life seemed also unlikely to develop where farmers had insecure tenancies (sharecropping or fixed rent), either because exclusive claims to farm land are not protected by the community or because the land owners only offer short-run tenancies. Such farmers had to focus their attention on the immediate short-run and did not have incentives for investment or the exploration of new production techniques, both of which were useful in the industrialization process. The situation, of course, was quite different among farmers who owned their land or who had secure, long-run tenancies without unduly high rents.

* Moderate sized and viable farms. If farms were too small to adequately support a family or if they were highly fragmented so that farming was inefficient, if the soil was poor or the climate was harsh, then the ensuing rural poverty could have had two adverse impacts on industrialization. First, the rural sector did not have the discretionary income to purchase manufactured goods. Second, these conditions focused attention on overcoming short-run difficulties, rather than encouraging long-term investment in physical and human capital. However, rural poverty also provided a ready labor force for proto-manufacturing and possibly a transition into manufacturing.

* Moderate inequalities of land ownership. High inequalities of land holdings could have had counteracting influences on industrialization. Such conditions could permit the accumulation of considerable wealth that could finance the new factories or infrastructure necessary for industrialization.[6] In England in the 18th century, R S. Neale (1975) notes that large landowners and aristocracy acted as significant sources of finance in crucial sectors such as mineral extraction, timber production, and iron manufacture; and their funds also constituted the bulk of investment in the turnpike system; and they contributed about one-third of the investment in canal construction. But high inequalities of land ownership could have also encouraged lavish lifestyles and a complete disdain for risky investing in industry or engaging in economic activities with only a long-run payoff, a situation reflected (parodied?) in Ivan Goncharov's 19th century novel about Oblomov, a Russian aristocrat and landowner too lazy to get out of bed and manage his estate. Finally, as previously noted, higher land concentration led to lower public expenditures on education.

Although many of these arguments are not completely convincing, they are sufficiently intriguing to warrant empirical exploration. For this purpose I again use data by Morris and Adelman (1988) on land tenure arrangements and ownership inequalities in 23 nations in 1850 and divide the nations into three groups, depending on the degree to which land tenure arrangements encourage (or

[6] Many types of manufacturing production required, by way of contrast, relatively little capital. For instance, Neale (1975) estimates that the fashionable English city of Bath was build in the 18th century in a matter of seventy years at a total capital cost roughly equivalent to the fixed capital invested in the cotton industry by the end of the that century. Although capital requirements for factories rose after the course of the 19th centuries, much new industry in nations beginning industrialization in the 20th century consisted of highly labor intensive industries requiring relatively little capital, either physical or human.

do not discourage) of industrialization.[7]

Table E-1 about here..

Using the data in Table E-1and calculating a simple linear regression, we find a statistically significant relationship - the higher the favorability of the land tenure and ownership composite variable, the earlier the threshold of industrialization.[8] This relationship is statistically significant for the complete sample and also for those nations with industrialization thresholds later than 1850, except when the nations with industrialization thresholds later than 1950 are eliminated from the sample. Given the approximate nature of the composite land tenure variable and the relatively small sample sizes, these results are gratifying and suggest that the hypothesis linking land tenure to the threshold of industrialization has some validity. Nevertheless, many exceptions to this relationship can be found. For instance, Russia in the 19th century appeared particularly unsuitable for industrialization, even after the emancipation of the serfs in 1861 when, as noted above, mobility between the countryside and the city was limited and rural poverty was widespread. Yet, under of

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[7] My composite code of the tenure and land concentration variables is constructed in a very simple manner and is explained in the notes to Table 5-4. Morris and Adelman (1988) have a much more elaborate composite code with nine different categories (their table A-39). As it turns out, however, the way in which they have calculated the composite code leads to a variable that is not statistically significant relation with the threshold of industrialization.

[8] The following simple OLS regressions can be calculated (where TI = date of threshold of industrialization; and CC = my composite code):

(1)	TI = 1945* - 31.1* CC	R^2 = .3960	Entire sample
	(17.8) (8.4)	n = 23	
(2)	TI = 1944* - 22.3* CC	R^2 = .3788	All nations with TI later than 1859
	(13.7) (7.1)	n = 18	
(3)	TI = 1900* - 8.0 CC	R^2 = .1918	All nations with 1850< TI < 1914
	(11.6) (5.2)	n = 12	

The numbers in parentheses are standard errors and an asterisk designates statistical significance at the 0.05 level. R^2 = coefficient of determination; n = sample size.

Table E-1: Land Tenure and Ownership in 1850

Country	Ind. thresh.	Code	Country	Ind. thresh.	Code	Country	Ind. thresh.	Code
England	1778	3	Netherlands	1881	3	New Zealand	1913	1
Switzerland	1817	3	Spain	1881	1	Argentina	>1950	1
Belgium	1823	1	Denmark	1885	3	Brazil	>1950	1
United States	1825	3	Italy	1887	1	Burma	>1950	1
France	1835	3	Canada	1889	3	China	>1950	1
Germany	1852	3	Russia	1899	1	Egypt	>1950	1
Sweden	1852	3	Japan	1902	3	India	>1950	1
Norway	1873	1	Australia	1904	1			

Codes:

1 = highly unfavorable conditions for industrialization: On the tenure dimension, this group of nations includes all those which had large estates with either unfree labor or hired workers or tenants on short term leases, countries where most cultivated land was subject to communal controls over type and methods of cultivation, or most cultivated land farmed by tenants with short-term, insecure leases and who did not receive recompense for any improvements they made (Morris and Adelman codes of 1, 2, 3, or 4). On the ownership dimension this includes those countries where most land was either communally owned or owned by smallholders, where parcellization and fragmentation were widespread (Morris and Adelman codes of 1 or 2). Any single one of these conditions would place a nation in this group.

2 = all countries not in groups 1 and 3. It turned out that no country fell into this group.

3 = favorable conditions for industrialization. On the tenure dimension, this group of nations includes those where most cultivated land was farmed by those who owned the land, or who had secure tenures and received recompense for improvements, or who owned the land but had some feudal obligations, or who paid fixed rents, received recompense for improvements, but had variable tenure lengths (Morris and Adelman codes of 5, 6, or 7). On the ownership dimension this included countries with medium to high inequality or with land held by smallholders but with viable farms without extreme parcellization (Morris and Adelman codes of 3, 4, or 5). A country had to have both of these conditions to be placed in this group.

Note: The raw data on which my composite codes are based come from Morris and Adelman (1988) and are presented in Appendix G.

considerable state guidance, industrial development proceeded rapidly so that by the last decade of the 19th century, workers in mining and manufacturing (including crafts) constituted 14 percent the labor force (Mitchell, 1998). In other countries as well, compensatory state policies and/or changes in the initial land tenure arrangements offset the adverse impact of the initial land tenure situation. Nevertheless, for those countries reaching the industrialization threshold after 1850, land tenure and ownership institutions in 1850 set up conditions which had an impact on the industrialization process occurring in the second half of the 19th and the first half of the 20th century.[9]

From the discussion in the previous chapter it seems likely that communities with relatively commercialized agricultural systems would be the most likely to have farmers with decision-making autonomy, free labor, relatively secure tenancies, moderately sized and viable farms, and moderate inequalities of land ownership. Such societal characteristics seem most likely to foster individuals who would have been more likely to become entrepreneurs and more open to modernization.

[9] I might also add that countries reaching the industrialization threshold after 1850 appeared to have a larger share of manufacturing starting in urban areas, in contrast to those nations reaching the industrialization threshold earlier, where rural industry was relatively more important. Although this phenomenon can, in part, be traced to the fall in transportation costs, it also lessened the influence of agricultural institutions on industrialization.

Appendix F: WAS THE SPIRIT OF CAPITALISM NECESSARY?

It is a commonplace that agricultural societies have been inherently conservative and that industrialization could have only come about when values and attitudes in the nation change radically, either through urbanization, marketization (both discussed above), or introduction of a radically new religion or ideology. In this section I deal briefly with the impact of religion.

In a well-known monograph on the spirit of capitalism, Max Weber (1958 (1904)) emphasized the importance of various forms of Protestantism in encouraging particular personal virtues that underlie the spirit of capitalism: thrift, diligence, farsightedness, honesty, hard work, rational risk taking, self-discipline, and individualism, in contrast to a focus on salvation, glory, conformity, honor, beauty, virtue, and traditionalism. In later works on the economy (for instance, Weber 1961 (1923)) he considerably downgraded this proposition, which was discussed furtively in only the last few pages. In the following decades, a number of historians and sociologists disputed Weber's linkage of between religion and a change in economic values (e.g., Samuelsson, 1964) and contention over these issues has continued up to today.

Several types of criticisms have been leveled against this argument. Some, such as Kurt Samuelson (1964) argue that religion had little with any such shift in values. Other such as Joel Mokyr (2002) claims that the most important change in values and attitudes was the notion that nature could be understood by a set of systematic experiments, that the knowledge gained should be not be confined to the elite but spread as widely as possible, and that such knowledge could be harnessed in economic activities ("industrial enlightenment," in his telling phrase). Yet others, such as Liah Greenfeld (2001) argue that it was a shift in social values and attitudes toward economic activities. That is, during most of world history those engaged in economic activities been stood

relatively low on the social scale and, as a result, such activities did not attract talent. Even as late as the early 18th century, nobles in France could not engage in commerce or manufacturing without loss of their nobility status; in contrast to England where industrialization came much earlier, where many of the nobility were heavily engaged in commercial activities without an apparent loss of status.

My own work on the topic (Pryor, 2003) starts with survey data on values and attitudes in more than 40 countries at the end of the 20th century and shows that the so-called spirit of capitalism really consists of several distinct sets of values, none of which is directly related to the level of economic development or the rate of economic growth, and that the situation in Europe several centuries before was unlikely to have been much different.

In brief, empirical support for Weber's conjecture about the spirit of capitalism appears fragile. Although a change in values appears and attitudes to have been important, that shift was something quite different that what Weber posited.

Appendix G: DATA ON LAND TENURE AND OWNERSHIP CONCENTRATION IN 1850

Table G-1: Land Tenure and Ownership in 1850

Country	TI	TN	OC	Country	TI	TN	OC	Country	TI	TN	OC
Great Britain	1778	5	5	Netherlands	1881	5	3	New Zealand	1913	2.5	1
Switzerland	1817	7	3	Spain	1881	2	6	Argentina	>1950[a]	2[c]	7[c]
Belgium	1823	5	2	Denmark	1885	7	4	Brazil	>1950	1	7[c]
United States	1825	6.5	3.5	Italy	1887	2	6	Burma	>1950[a]	3	3
France	1835	6.5	3	Canada	1889	7	3.5	China	>1950	6.5	2
Germany	1852	7	5	Russia	1899	1	6	Egypt	>1950[a]	1	6
Sweden	1852	7	3	Japan	1902	6	3	India	>1950	3	3[c]
Norway	1873	3	2	Australia	1904	3.5	7[c]				

Tenure measures (TN)

1 = Most farmers work for large estates or latifundia as unfree labor.

2 = Same as above, but farmed by hired labor or tenants with short term leases

3 = Most cultivated land farmed by farmers with title to land but subject to communal controls over type and method of cultivation. 2.5 = Fully communal agriculture predominates.

4 = Most cultivated land farmed by short-term tenants with little security of tenure; little recompense for improvements.

5 = Most cultivated land farmed by farmer paying fixed rents, variable tenure lengths, recompense for improvements; remaining land by independent farmers with full ownership

6 = Most cultivated land farmed by peasants whose ownership rights constrained by various types of feudal obligations.

7 = Most cultivated land farmed by independent farmers who own most of land or who have secure tenures, fixed rents, and receive recompense for improvements. 6.5 = same, but rough equality of holdings of independent cultivators and tenants

Concentration of ownership measures (OC)

1 = Most land communally owned

2 = Most cultivated land owned by smallholders; parcellization and fragmentation widespread

3 = Most land held by smallholders, but excludes extreme parcellization and fragmentation of land

4 = Most holdings medium size using permanently hired workers. 3.5 = regions dominated by small holders with no permanently hired labor

5 = Medium to high inequality: 4.5 = when smallholders predominate in number

6 = High inequality; top 10 percent hold 75 percent of cultivated land; but smallholders predominate in number.

7 = Very high inequality: top 10 percent of landholders hold at least 75 percent of cultivated land

Note: TN = threshold of industrialization; a = my estimate; b = 1890. C = rough evaluation. The data come from Morris and Adelman (1988), Tables A-37 and A-38.

BIBLIOGRAPHY

Allen, Robert C. 1999. "Tracking the Agricultural Revolution in England," Economic History Review 52, No. 2 (1999): 209-235.

Bairoch, Paul. 1982. "International Industrialization Levels from 1750 to 1980." Journal of European Economic History 11, No. 2 (Fall): 269-325.

---. 1993. Economics and World History: Myths and Paradoxes. Chicago: University of Chicago Press.

Bairoch, Paul, Jean Batou and Pierre Chèvre. 1988. The Population of European Cities: Data Bank and Short Summary of Results. Genève: Librarie Droz.

Blomme, Jan and Herman Van der Wee. 1994. "The Belgium Economy in a Long-Term Historical Perspective: Economic Development in Flanders and Brabant, 1500-1812." in Angus Maddison and Herman Van der Wee, editors. Economic Growth and Structural Change: Comparative Approaches over the Long Run. Bocconi: Università Bocconi.

Brenner, Robert. 1985-a. "Agrarian Class Structure and Economic Development in Pre-Industrial Europe." Pp. 10-64 in Aston and Philpin, editors.

---. 1985-b. "The Agrarian Roots of European Capitalism." Pp. 213-327 in Aston and Philpin. editors.

Butlin, N.G. 1962. Australian Domestic Product, Investment and Foreign Borrowing, 1861-1938/39. Cambridge: University Press.

Buyst, Erik. 2002. "Estimates of Economic Growth in the Southern Low Countries/Belgium, 1770-1846." draft paper.

Cipolla, Carlo M. 1969. Literacy and Development in the West. Hammondsworth, Middelsex:

Penguin.

Crafts, N. F. R. 1983. "British Economic Growth, 1700-1831: A Review of the Evidence." Economic History Review 2nd series, 36, No. 2 (May): 177-99.

---. 1985. British Economic Growth During the Industrial Revolution. Oxford: Clarendon Press.

Deane, Phyllis, and W. A. Cole. 1969. British Economic Growth, 1688-1959: Trends and Structure. London, Cambridge University Press.

Ercolani, Paolo.1969. "Documentazione statistica di base." pp. 380-463 in Giorgio.Fua, editor. Lo sviluppo economico in Italia, Vol 3. Milan: Franco Angeli.

Firestone, O. J. 1958. Canada's Economic Development, 1867-1953. London: Bowes and Bowes.

Gerschenkron, Alexander. 1966. Economic Backwardness in Historical Perspective: A Book of Essays. Cambridge, Mass.: Belknap Press of Harvard University Press.

Goldsmith, Raymond. 1961, "The Economic Growth of Tsarist Russia, 1860-1913." Economic Development and Cultural Change 9, no. 3 (April): 441-75.

Goossens, Martine. 1993. The Economic Development of Belgian Agriculture: A Regional Perspective, 1812-1846. Leuven: Leuven University Press.

Greenfeld, Liah. 2001. The Spirit of Capitalism: Nationalism and Economic Growth. Cambridge, Mass.: Harvard University Press.

Gregory, Paul R. 1982. Russian National Income, 1885-1913. New York: Cambridge University Press.

---. 1997. "Searching for Consistency in Historical Data: Alternative Estimates of Russia's Industrial Production, 1887-1913." The Journal of Economic History 57, no. 1 (March): 196-203.

Hansen, Svend Aage. 1974. Økonomisk vækst i Danmark, Volume 2. Copenhagen: Akademisk Forlag.

Hjerppe, Riitta.1989. The Finnish Economy, 1860-1985. Helsinki: Bank of Finland Govt Printing Center.

Hoffmann, Walther G. 1965. Das Wachstum der deutschen Wirtschaft seit der Mitte des 10. Jahrhunderts. Berlin: Springer Verlag.

Jones, Eric L. 1981. The European Miracle: Environments, Economies, and Geopolitics in the History of Europe and Asia. New York: Cambridge University Press.

Jones, Eric L. and Stuart J. Woolf, 1969 "The Historical Role of Agrarian Change in Economic Development." Pp. 10-23 in Jones and Woolf, editors. Agrarian Change and Economic Development. London: Methuen & Co.

Kausel, Anton. 1979. "Oesterreichs Volkseinkommen 1830 bit 1913." Pp. 689-720 in Oesterreich-ischen Statistischen Zentralamt, Geschichte und Ergebnisse der zentralen amtlichen Statistik in Oesterreich 1829-1979. Vienna.

Krantz, Olle and Carl-Axel Nilsson.1975. Swedish National Product 1861-1970. Stockholm: CWK Gleerup.

Lains, Pedro. 1995. A Economia Portuguesa no Século XIX. Lisbon: Impresa Nacional Casa da Moeda.

Macfarlane, Alan.1978. The Origins of English Individualism. New York: Basel Blackwell.

Maddison, Angus. 1983. "A Comparison of Levels of GDP Per Capita in Developed and Developing Countries, 1700-1980." Journal of Economic History 43, No. 1 (March): 27-43.

---. 1991. Dynamic Forces in Capitalist Development. New York: Oxford University Press.

---. 1995. Monitoring the World Economy, 1820-1992. Paris: OECD.

---. 2001. The World Economy: A Millennial Perspective. Paris: OECD.

Mitchell, Brian R.. 1998. International Historical Statistics: Europe, 1759-1993, 4th edition. New York: Stockten Press.

Mokyr, Joel.2002. The Gifts of Athena: Historical Origins of the Knowledge Economy. Princeton, N.J. : Princeton University Press.

Morris, Cynthia Taft and Irma Adelman. 1988. Comparative Patterns of Economic Development, 1859-1914. Baltimore: Johns Hopkins University Press.

Neale, R. S. 1975. "The Bourgeoisie, Historically, Has Played a Most Revolutionary Part." Pp. 84-104 in Eugene Kamenka and R. S. Neale, editors. Feudalism, Capitalism and Beyond. Canberra: Australian National University Press.

Norway, Statistisk Sentralbyra. 1965. Nasjonalregnskap 1865-1960. Oslo.

Ohkawa, Kazushi and Miyohei Shinolara. 1979. "Appendix Tables" in Kazushi Ohkawa and Miyohei Shinohara, editors. Patterns of Japanese Economic Development. New Haven: Yale University Press.

Pomeranz, Kenneth. 2000. The Great Divergence: China, Europe, and the Making of the Modern World Economy. Princeton, NJ: Princeton University Press.

Prados de la Escosura, Leandro 2003. El progreso económico de España, 1850-2000, Madrid: Fundación BBVA.

Pryor, Frederic L. 1985. "Climatic Fluctuations as a Cause of Differential Economic Growth of the Orient and Occident: A Comment." Journal of Economic History 45, No. 3: 667 - 675.

---. 2003. "The Role of Values in the Alleged Spirit-of-Capitalism," unpublished essay.

Reynolds, Lloyd G. 1985. Economic Growth in the Third World, 1850-1980. New Haven: Yale university Press.

Samuelsson, Kurt. 1964. Religion and Economic Action: A Critique of Max Weber. New York: Harper & Row.

Smits, Jan-Pieter, Edwin Horlings, and Jan Luiten van Zanden. 2000. Dutch GNP and its Components, 1800-1913, Monograph Series No. 5. Groningen: Groningen Growth and Development Centre.

Sweden, Statistiska centralbyrran.1969. Historisk statistik for Sverige, Volume 1 Stockholm: KL Beckmans Tryckerier AB.

Toutain, Jean-Claude. 1987. Le produit intérieur brut de la France de 1789 à 1982, Cahiers de l' I.S.M.E.A., Série Histoire quantitative de l'Économie française, no. 15. Grenoble: Presses Universitaires de Grenoble.

United States Bureau of the Census. 1975. Historical Statistics of the United States: Colonial Times to 1700. Washington, D.C. G.P.O.

Weber, Max. 1961 (1923). General Economic History, translated by Frank H. Knight. New York: Collier Books.

---. The Protestant Ethic and the Spirit of Capitalism. 1958 (1904). New York, Scribner [1958].

Weiss, Thomas.1994. "Economic Growth Before 1860: Revised Conjectures." Pp. 11-28 in Thomas Weiss and Donald Schaefer, editors. American Economic Development in Historical Perspective. Stanford: Stanford University Press.

Wrigley, E. A. 1987. People, Cities, and Wealth : The Transformation of Traditional Society .New York: Blackwell.

Wrigley, E. A. and R. S. Schofield. 1981. The Population History of England, 1541-1871. Cambrdige, MA: Harvard University Press.